Using GRIDVIEW to Better Understand the Early Bombardment History of the Moon, Mars and Earth

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For more than a decade we have used GRIDVIEW to help analyze topographic and related data for Mars and more recently for the Moon. Our focus has been to employ the stretching, contouring, profiling, circle-fitting and other capabilities of GRIDVIEW to search for Quasi-Circular Depressions (CTAs) in MOLA, LOLA and other topographic data, and for Circular Thin Areas (CTAs) in Mars and Moon model crustal thickness data. Both QCDs and CTAs likely represent buried or obscured impact craters not readily visible in image data. We found clear evidence for a much larger population of buried impact craters in the northern lowlands of Mars (Frey et al. 2002), suggesting that part of the Red Planet is not significantly younger than the southern highlands. Edgar and Frey (2008) found that the N(300) crater retention ages of both areas were essentially identical, a conclusion confirmed by Wyatt (unpublished data) using more recent crustal thickness data for Mars. MOLA topographic data and MOLA-derived crustal thickness data were used to both identify a large number of previously unrecognized very large impact basins (D> 1000 km) on Mars and to determine relative crater retention ages for them (Frey, 2008). The distribution of N(300) CRAs suggested most formed in a relatively short interval of time. This dating also suggested the main magnetic field of Mars disappeared during this period (Lillis et al., 2008), because only the youngest basins systematically lack a remagnetized signature. Similar QCD and CTA analysis of first Clementine (Frey, 2011) and more recently LOLA topographic and LOLA-derived crustal thickness data for the Moon (Frey et al., 2011) revealed a significantly larger population of impact basins > 300 km in diameter than previously known. N(50) CRAs suggest a two-peak distribution of ages (Frey, 2012). An improved counting process confirms the two peaks, perhaps indicating both a pre-Nectaris Early Heavy Bombardment (EHB) as well as a Late Heavy Bombardment (LHB) on the Moon (Frey and Burgess, 2012, this meeting), with obvious implications for the early bombardment history of the Earth.